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Wind wave climate

(with particular attention to extreme and freak waves)

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Wind waves are of the main hazards, affecting the human activity and needed for ship-building design of near shore facilities, operability studies, planning and management of coastal and port operation and maintenance.

Continuous 30 year hindcasting of directional spectra and it parameters is performed. This is the base if wave climate investigation. Nested models Wave Watch and SWAN applied. The NCEP/NCAR and ERA reanalysis wind fields used as input data. Baltic, Barents, Black, Azov, Caspian, North, Okhotsk, Japan, Bering seas used as deep and shallow water basins.

In compliance with accepted practice applied statistical characteristics of wind waves are subdivided to operational and extreme. Operational statistics describe the everyday wind and wave conditions. Extreme characteristics determine the so-called "structure survival regime". There are a lot of approaches to calculations of extreme wave heights at a point (classical unconditional extremes). Their comparison, advantages and disadvantages will be regarded.

Freak (rogue) waves have some principal difference from extreme wave, mainly due to their form and asymmetry. Physical hypotheses of freak wave generation allow their arising in any place of an Ocean. Any metocean event described by a system of nonlinear thermo hydrodynamic equations possesses their own freaks. Classical statistical analysis of time series do not allows estimating the probabilities of freak wave

occurrence and associated weather conditions. The approach regarded freak wave as multidimensional random event is proposed. Contaminated distribution may be used for probability density approximation of joint extreme and freak wave. Special attention is paid to investigation of field conditions leading to freak wave generation.

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